CLAIMS

1. A fluid drive unit for vibrating fluid charged in a passage in a direction of the passage, comprising:

a moving piece accommodating portion communicating with both end portions of the passage, a moving piece slidably accommodated in the moving piece accommodating portion, the fluid in the passage being accommodated in spaces interposed between both end portions of the moving piece accommodating portion in the sliding direction of the moving piece and the end portions of the passage; and

a drive means for reciprocating the moving piece in the moving piece accommodating portion in the sliding direction, wherein

the fluid charged in the passage is vibrated in the passage direction when the moving piece is reciprocated by the drive means.

2. A fluid drive unit according to claim 1, wherein the moving piece accommodating portion is a cylinder communicating with both end portions of the passage, and the moving piece is a piston reciprocating in the cylinder in the axial direction of the cylinder which is the sliding direction of the moving piece.

3. A fluid drive unit according to claim 1, wherein the moving piece includes a sliding member, and the sliding face of the moving piece is composed of the sliding member.

4. A fluid drive unit according to claim 3, wherein the moving piece includes a pair of sliding members arranged at symmetrical positions on both sides of the moving piece in the sliding direction.

5. A fluid drive unit according to claim 1, wherein the moving piece includes a magnetic body, and the drive means reciprocates the moving piece by magnetic force imparted to the magnetic body.

6. A fluid drive unit according to claim 3, wherein the moving piece includes a magnetic body, the

sliding member is arranged in the periphery of the magnetic body, and the drive means reciprocates the moving piece by magnetic force imparted to the magnetic body.

7. A fluid drive unit according to claim 5, wherein the moving piece includes a permanent magnet to be used as the magnetic body.

8. A fluid drive unit according to claim 5, wherein the drive means includes an annular exciting coil surrounding a side of the moving piece accommodating portion in the sliding direction of the moving piece, a magnetic flux is formed in the moving piece accommodating portion by the exciting coil, and the moving piece is reciprocated by magnetic force generated by the exciting coil.

9. A fluid drive unit according to claim 5, the drive means including: an electromagnet composed of an annular exciting coil surrounding a side of the moving piece accommodating portion in the sliding direction of the moving piece; and a yoke, which is used for forming a magnetic path, covering an outer circumference of the exciting coil, for forming a magnetic pole opposed to the side of the moving piece accommodating portion, wherein the moving piece is reciprocated in the moving piece accommodating portion when the magnetic poles of the electromagnet are periodically inverted.

10. A fluid drive unit according to claim 9, further comprising a yoke connecting member fixed to both end portions of the moving piece accommodating portion, for fixing the yoke in a state of non-contact with respect to the moving piece accommodating portion.

11. A fluid drive unit according to claim 9, wherein the exciting coil is fixed to the yoke in a state in which a gap is formed with respect to the side of the moving piece accommodating portion.

12. A fluid drive unit according to claim 9, further comprising:

a spring member for pushing an end portion of the moving piece so as to slidably arrange the moving piece at a predetermined position in the moving piece accommodating portion; and

a spring engaging portion for fixing the spring member in the moving piece accommodating portion in a state in which the spring member generates a pushing force.

13. A fluid drive unit according to claim 5, wherein the moving piece includes a pair of permanent magnets, which are the magnetic body, arranged at positions separate from each other by a predetermined interval in the sliding direction so that the magnetic poles of the same type can be opposed to each other.

14. A fluid drive unit according to claim 13, the moving piece including: a moving piece central portion composing member for composing a central portion of the moving piece itself; and a moving piece end portion composing member for composing an end portion of the moving piece itself, wherein

the moving piece central portion composing member, the permanent magnet and the moving piece end portion composing member are connected to each other by screws under the condition that the permanent magnet is interposed between the moving piece central portion composing member and the moving piece end portion composing member.

15. A fluid drive unit according to claim 13, wherein the pair of the permanent magnets are symmetrically arranged with respect to the center of the moving piece.

16. A fluid drive unit according to claim 5, wherein the drive means includes a pair of annular exciting coils surrounding a side of the moving piece accommodating portion in the sliding direction of the moving piece, the pair of annular exciting coils are arranged parallel to each other in the sliding direction

of the moving piece, and the moving piece is reciprocated by a magnetic force generated by the pair of exciting coils.

17. A fluid drive unit according to claim 16, wherein the moving piece is reciprocated in the moving piece accommodating portion in a region surrounded by the end portion of one exciting coil on the passage side and by the end portion of the other exciting coil on the passage side.

18. A fluid drive unit according to claim 1, wherein the moving piece includes temporary magnets, which are the magnetic bodies, arranged at both end portions in the sliding direction, and a permanent magnet is arranged between the temporary magnets arranged at both end portions.

19. A fluid drive unit according to claim 16, wherein the moving piece includes temporary magnets, which are the magnetic bodies, arranged at both end portions in the sliding direction, a permanent magnet is arranged between the temporary magnets arranged at both end portions, and the length of each temporary magnet in the moving piece sliding direction is less than the length of the exciting coil in the moving piece sliding direction.

20. A fluid drive unit according to claim 19, wherein the length of each temporary magnet in the moving piece sliding direction is 16% to 42% of the length of the exciting coil in the moving piece sliding direction.

21. A fluid drive unit according to claim 20, wherein the length of each temporary magnet in the moving piece sliding direction is 25% of the length of the exciting coil in the moving piece sliding direction.

22. A fluid drive unit according to claim 18, wherein the permanent magnet is arranged on the central side of the moving piece with respect to the outermost face of the temporary magnet in the radial direction perpendicular to the moving piece sliding direction.

23. A fluid drive unit according to claim 18, wherein the moving piece includes a cylindrical body for accommodating the permanent magnet, the permanent magnet is accommodated in the cylindrical body, and the temporary magnets are arranged opposed to each other at both end portions of the permanent magnet in the sliding direction of the moving piece.

24. A fluid drive unit according to claim 18, wherein the moving piece includes a moving piece body composed of temporary magnets arranged at both end portions and also composed of a connecting body, the length in the radial direction perpendicular to the moving piece sliding direction of which is less than that of the temporary magnets, for connecting the temporary magnets arranged at both end portions, the moving piece body is integrated into one body, and the permanent magnet is arranged so that it surrounds the connecting body of the moving piece body.

25. A fluid drive unit according to claim 18, wherein the moving piece is composed in a manner such that the temporary magnets are pivotally arranged at both end portions of the permanent magnet.

26. A fluid drive unit according to claim 1, further comprising:

a passage connecting member engaged with an opening end of the moving piece accommodating portion, for connecting an end portion of the passage with the moving piece accommodating portion so that the passage and the moving piece accommodating portion can communicate with each other;

an elastic sealing member provided in an engaging portion of the passage connecting member with the moving piece accommodating portion, wherein

the passage connecting member is fixed to the moving piece accommodating portion by an elastic force of the elastic sealing member.

27. A fluid drive unit according to claim 8,

further comprising:

a passage connecting member engaged with an opening end of the moving piece accommodating portion, for connecting an end portion of the passage with the moving piece accommodating portion so that the passage and the moving piece accommodating portion can communicate with each other;

an elastic sealing member provided in an engaging portion of the passage connecting member with the moving piece accommodating portion, wherein

the passage connecting member is fixed to the moving piece accommodating portion by an elastic force of the elastic sealing member, and

the exciting coil is fixed by the passage connecting member so that a gap can be formed between the exciting coil and the side of the moving piece accommodating body.

28. A fluid drive unit according to claim 1, wherein a vibration sound suppressing member for suppressing the vibration sound generated by the reciprocating motion of the moving piece is provided in the moving piece accommodating portion.

29. A fluid drive unit according to claim 1, wherein a spring member for restricting the sliding range of the moving piece is provided in the moving piece accommodating portion.

30. A fluid drive unit according to claim 3, wherein the sliding member is arranged on the periphery of a point of application of a force acting on the moving piece when the drive means is operated.

31. A fluid drive unit according to claim 1, wherein a groove is formed on a surface of the moving body from both end portions of the moving piece in the sliding direction to the central portion.

32. A fluid drive unit according to claim 31, wherein the groove formed on the surface of the moving piece is a spiral groove turning on the side of the

moving piece in the sliding direction.

33. A fluid drive unit according to claim 1, wherein the area of the cross section of the moving piece accommodating portion in the direction perpendicular to the moving piece sliding direction is larger than an area of the cross section of the passage.

34. A heat transport system comprising:

a fluid drive unit described in claim 1; and

a heat transport body having a passage communicating with the moving piece accommodating portion of the fluid drive unit, wherein heat is exchanged with the fluid vibrating in the passage when the fluid drive unit is operated so as to transport heat, which is supplied from an external heat source, to a low temperature portion.

35. A heat transport system according to claim 34, wherein the heat transport body is composed in a manner such that the moving directions of the fluid in the passages, which are adjacent to each other, are opposite to each other, the heat transport body exchanges heat with the fluid vibrating in the passage when the fluid drive unit is operated, so that heat of the fluid is transported to the fluid in the adjacent passage and heat supplied from an external heat source to the fluid is transported to a low temperature portion.